

Understanding Pipe Standard Specifications and Their Applications

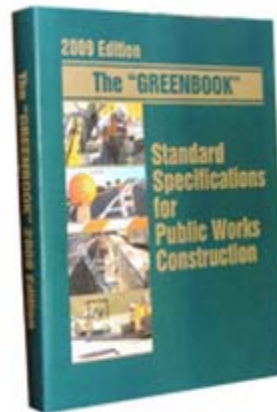
ASCE | PIPELINES 2010
CONFERENCE

Climbing New Peaks to
Infrastructure Reliability: | **Renew, Rehab
and Reinvest**



Speaker: Xiangquan Li
HDR Engineering, Inc.

Many Standard Specifications Describe Pipe Manufacturing



European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung



Benefits of Using Standard Specifications

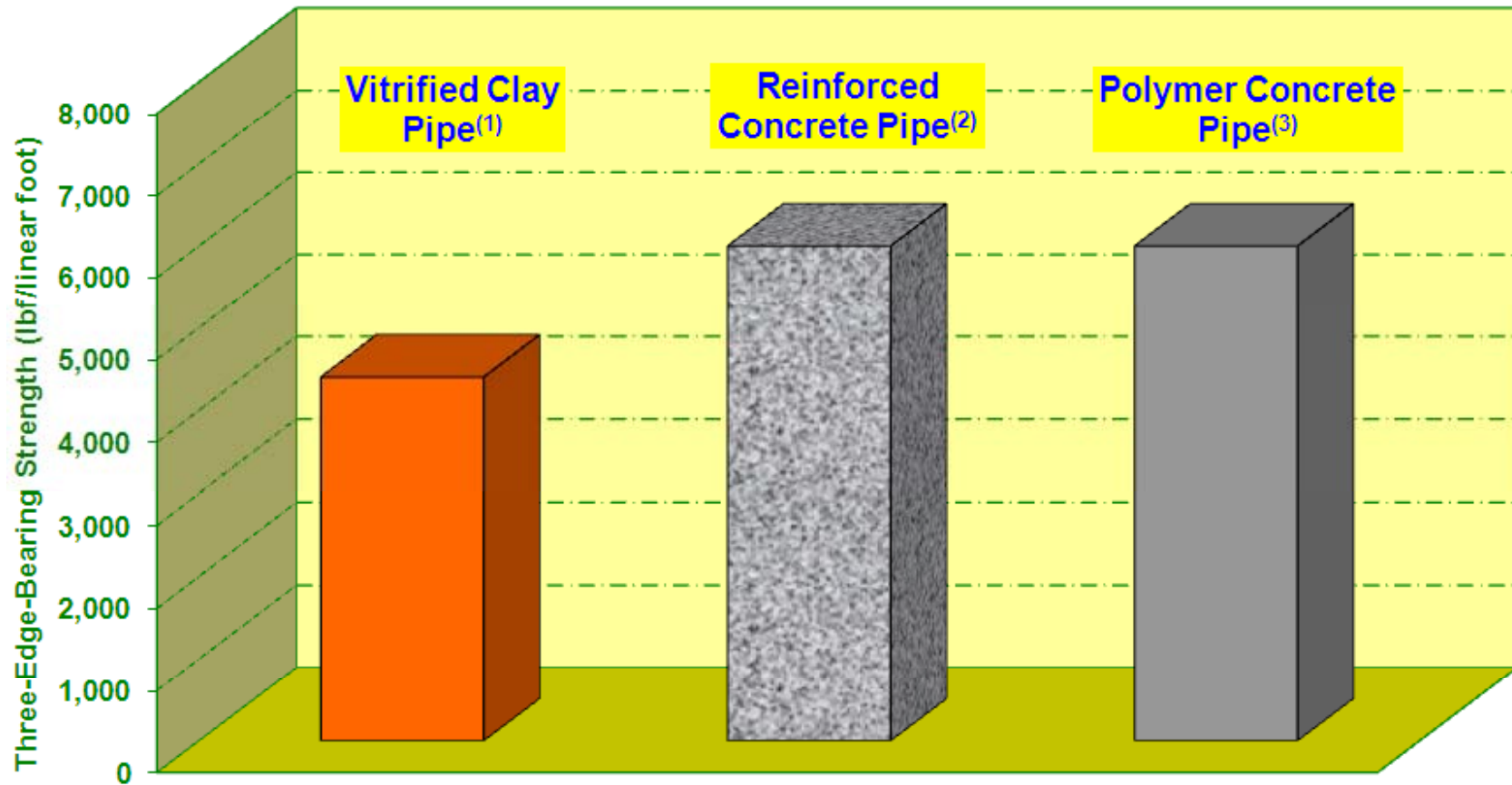
- Establish Industry Quality Standard
- Easy to Reference
- Avoid Duplicate Research Effort
- Assurance on Product Quality

Things to Note when Using Standard Specifications

- Different Pipes have Different Standards
- Same Type of Pipe has Different Standards

*Different Pipes have
Different Standards*

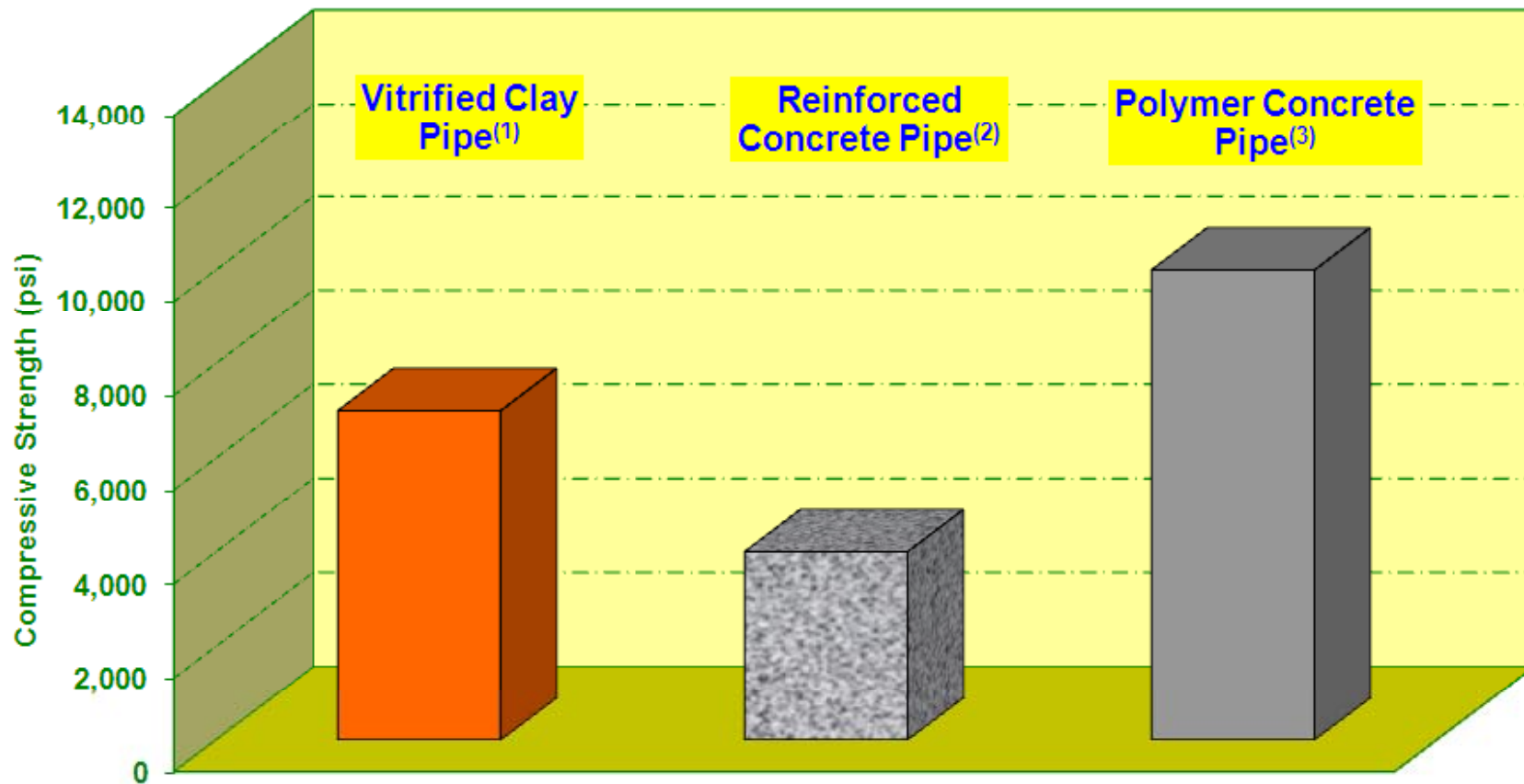
Minimum Three-Edge-Bearing Strength for 24-inch Diameter Pipes



Notes:

- 1. ASTM C700 Extra Strength Pipe.
- 2. ASTM C76 Class IV Pipe. Strength Calculated based on Ultimate D-Load.
- 3. ASTM D6783 Class IV Pipe. Strength Calculated based on Short-term D-Load.

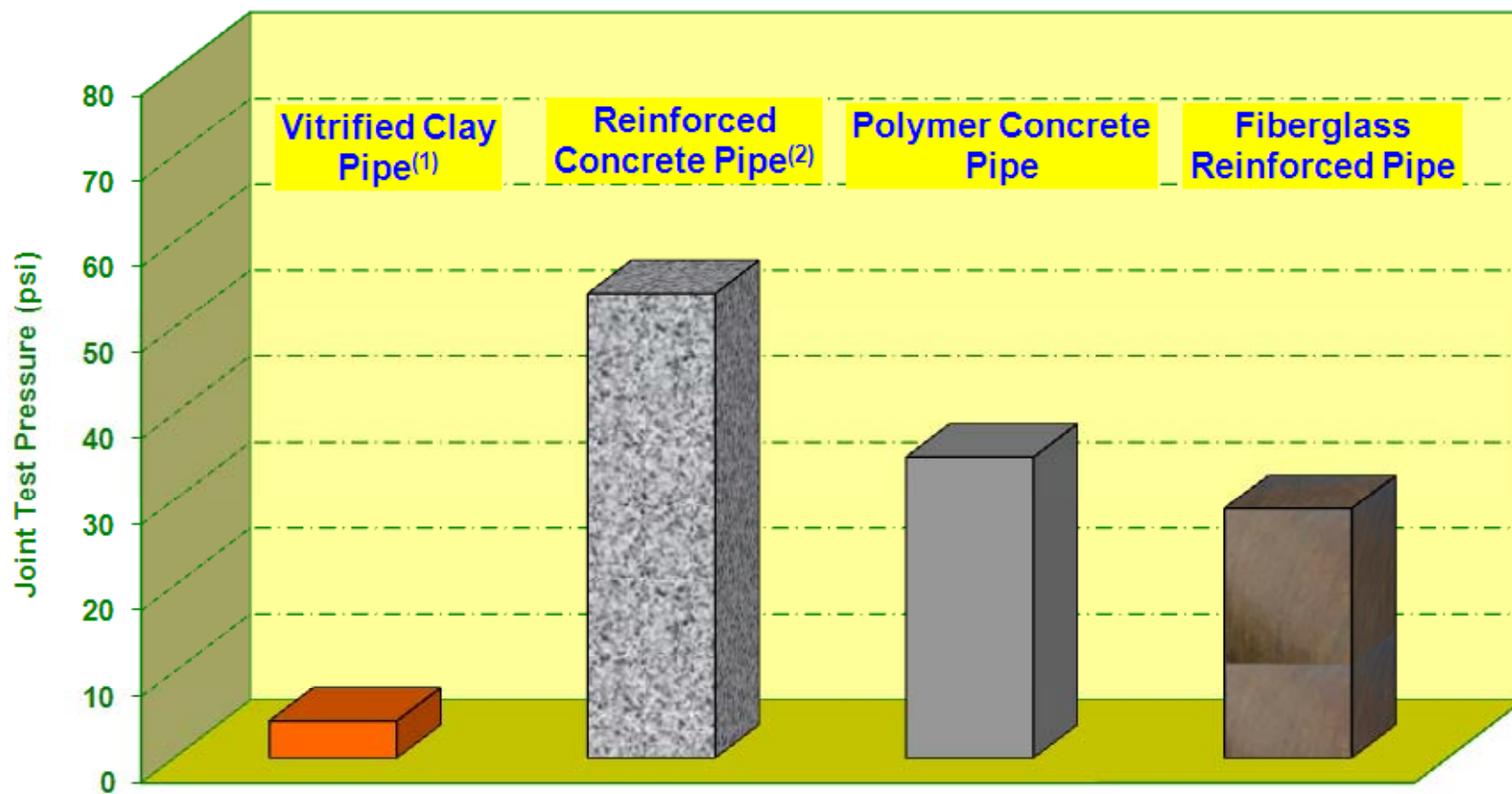
Minimum Material Compressive Strength for 24-inch Diameter Pipes



Notes:

- 1. ASTM C700 Extra Strength Pipe.
- 2. ASTM C76 Class IV Pipe. Type B Wall.
- 3. ASTM D6783 Class IV Pipe. Short-term Strength.

Pipe Joint Test Pressure



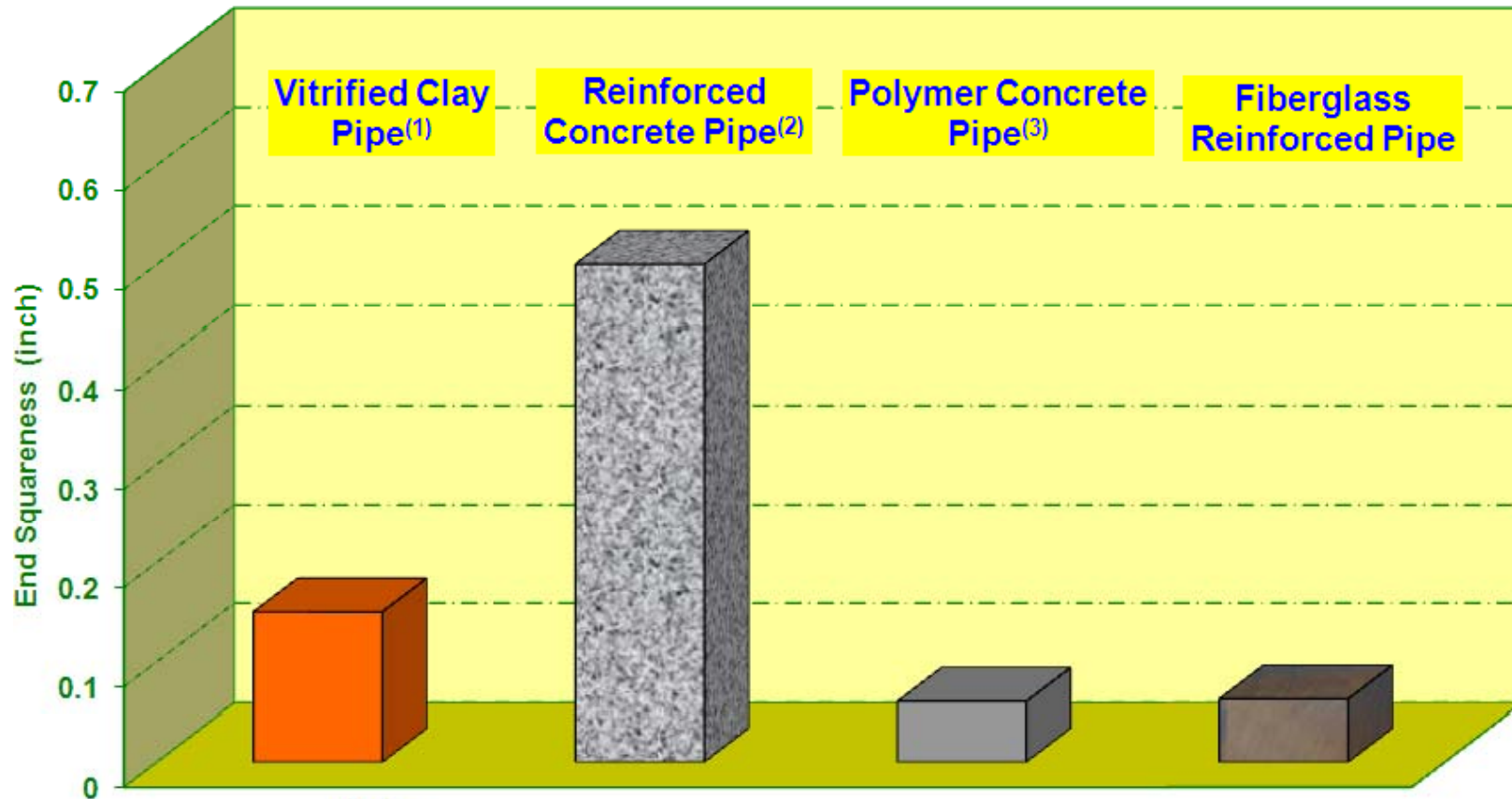
Notes:

- 1. Joint test pressure between 3.5 and 4.3 psi.
- 2. Joint test pressure between 3.5 and 54 psi.

Pipe Material Chemical Resistance

Vitrified Clay Pipe	Reinforced Concrete Pipe	Polymer Concrete Pipe	Fiberglass Reinforced Pipe
Chemically Inert	Subject to H ₂ S attack	Long Term Acid or Base Exposure may Reduce Material Strength	Long Term Acid Exposure may Reduce Material Strength

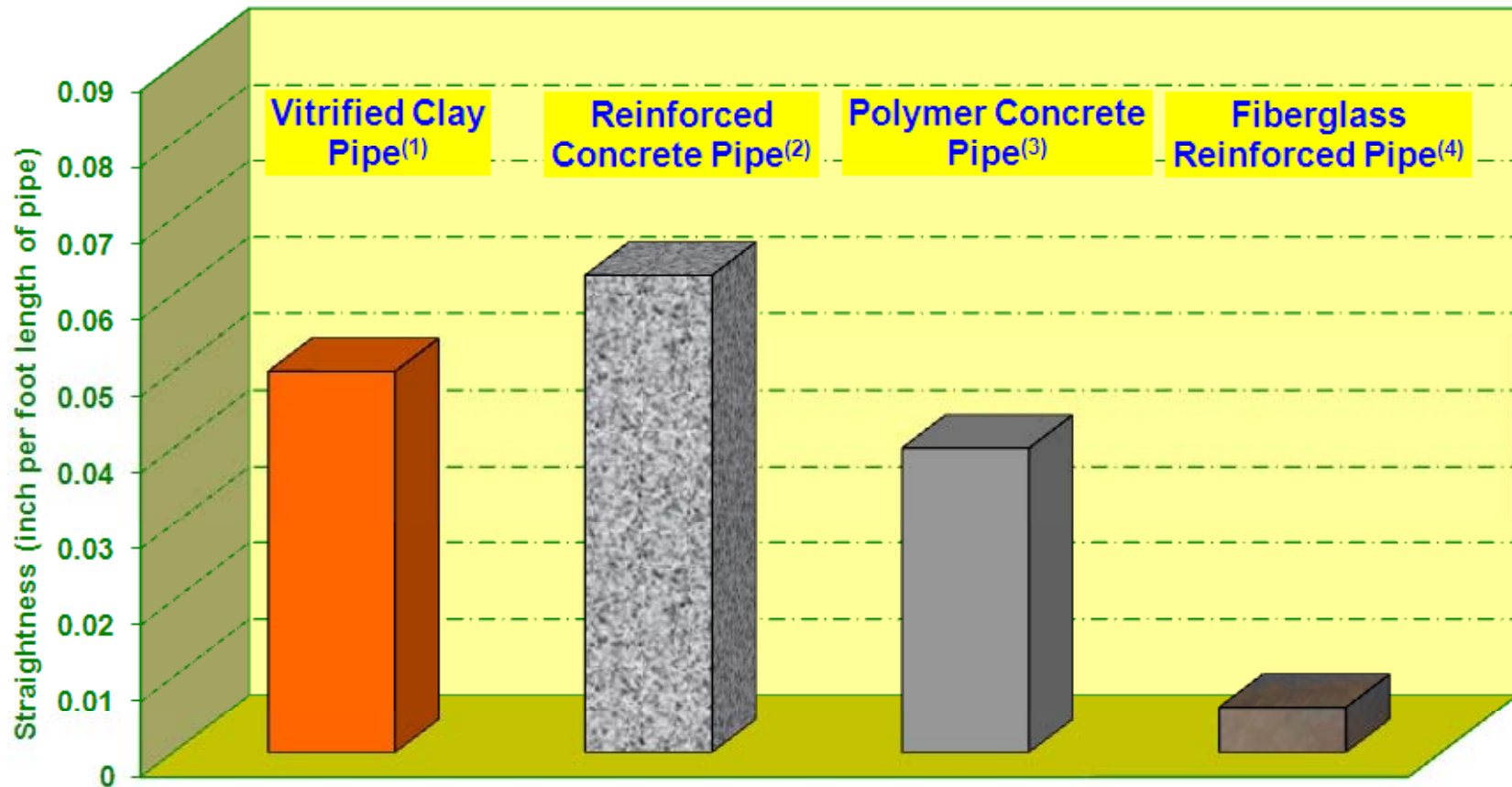
Pipe End Squareness Tolerance for 24-inch Diameter Pipes



Notes:

- 1. ASTM C1208. Based on an Outside Diameter of 30-inch.
- 2. Greenbook Section 207-23. Microtunneling Pipe.
- 3. ASTM D6783.
- 4. Greenbook Section 207-22. Microtunneling Pipe.

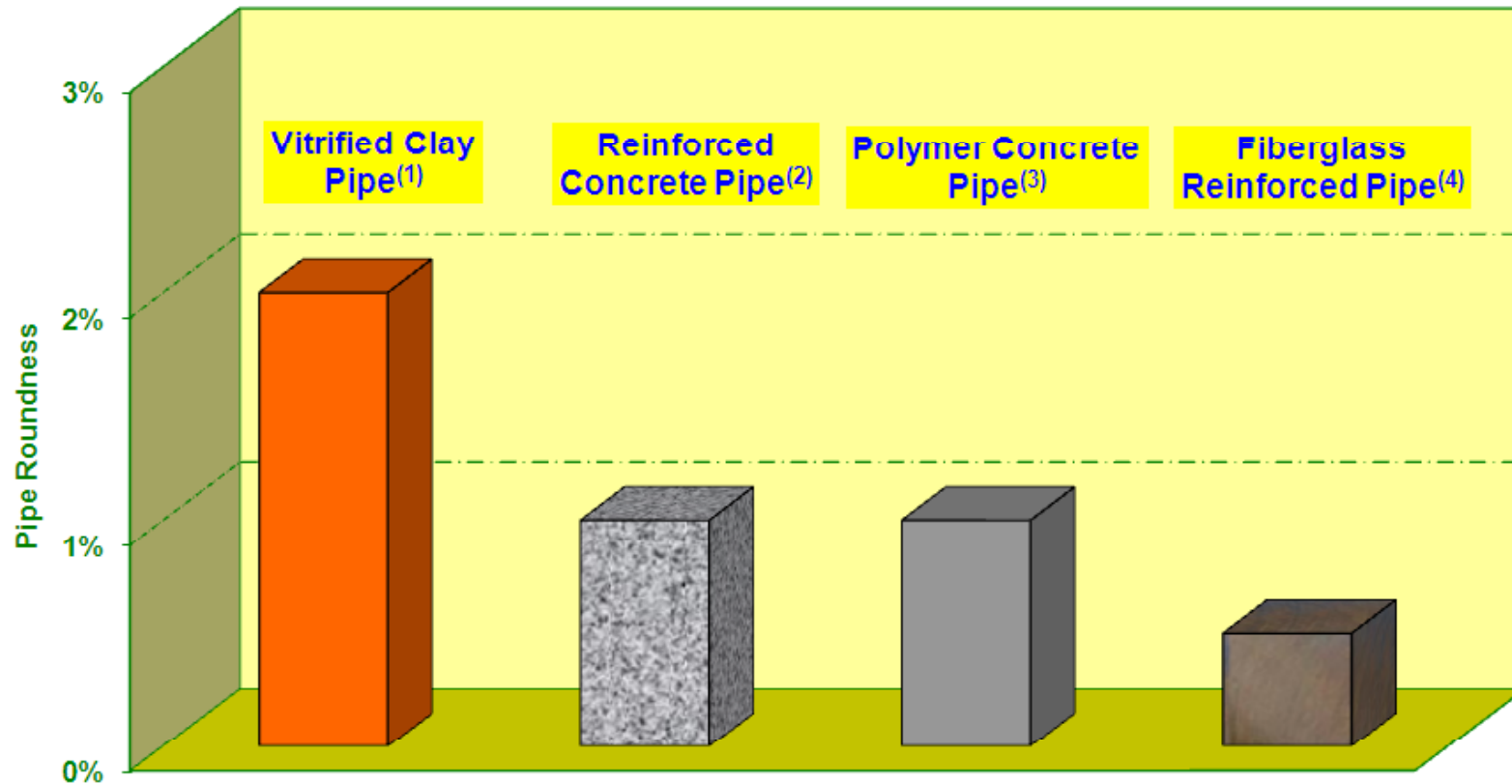
Pipe Straightness Tolerance for 24-inch Diameter Pipes



Notes:

- 1. ASTM C1208.
- 2. Greenbook Section 207-23. Microtunneling Pipe.
- 3. ASTM D6783. Jacking Pipe.
- 4. Greenbook Section 207-22. Microtunnel Pipe.

Pipe Roundness Tolerance for 24-inch Diameter Pipes

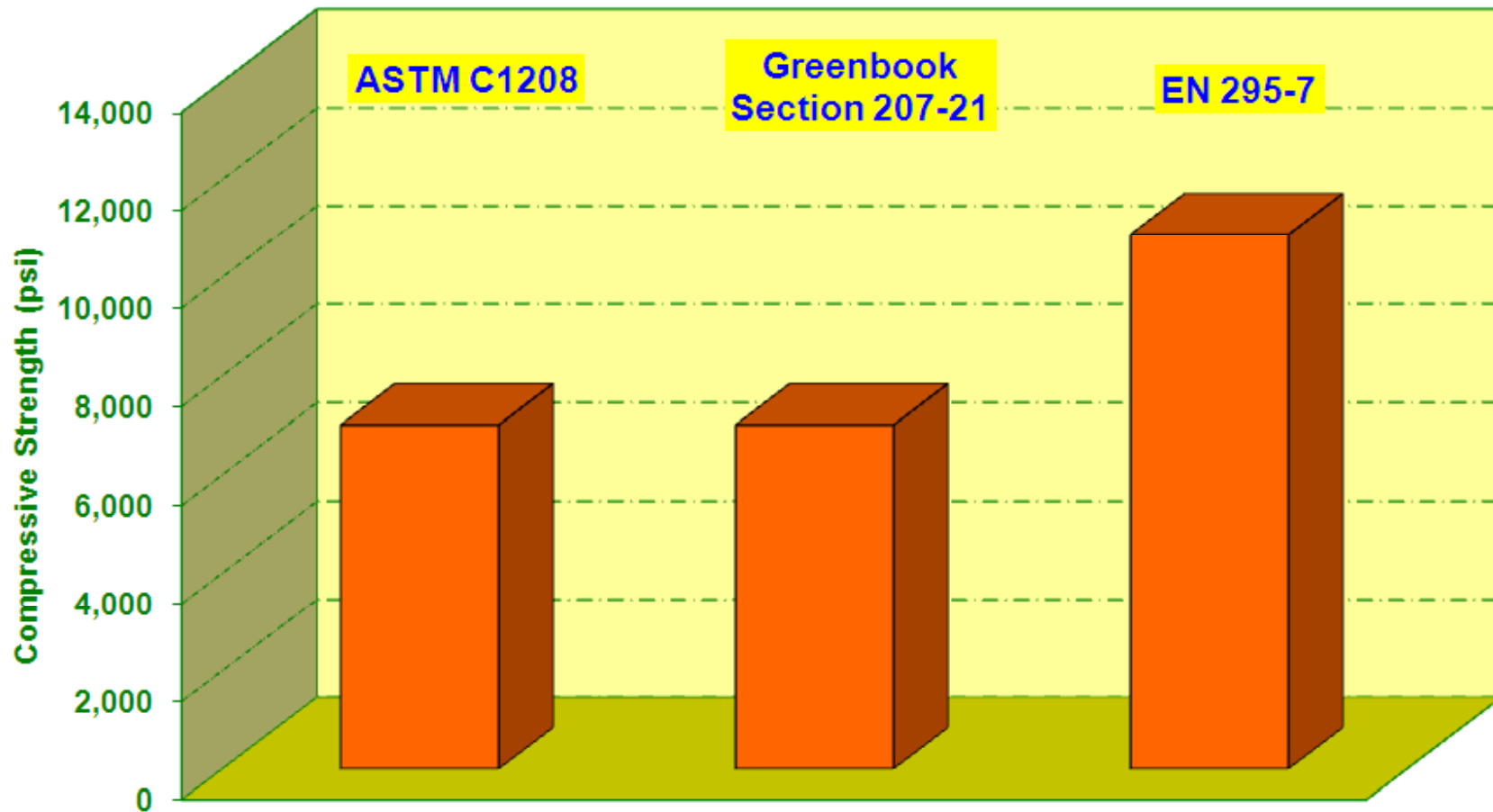


Notes:

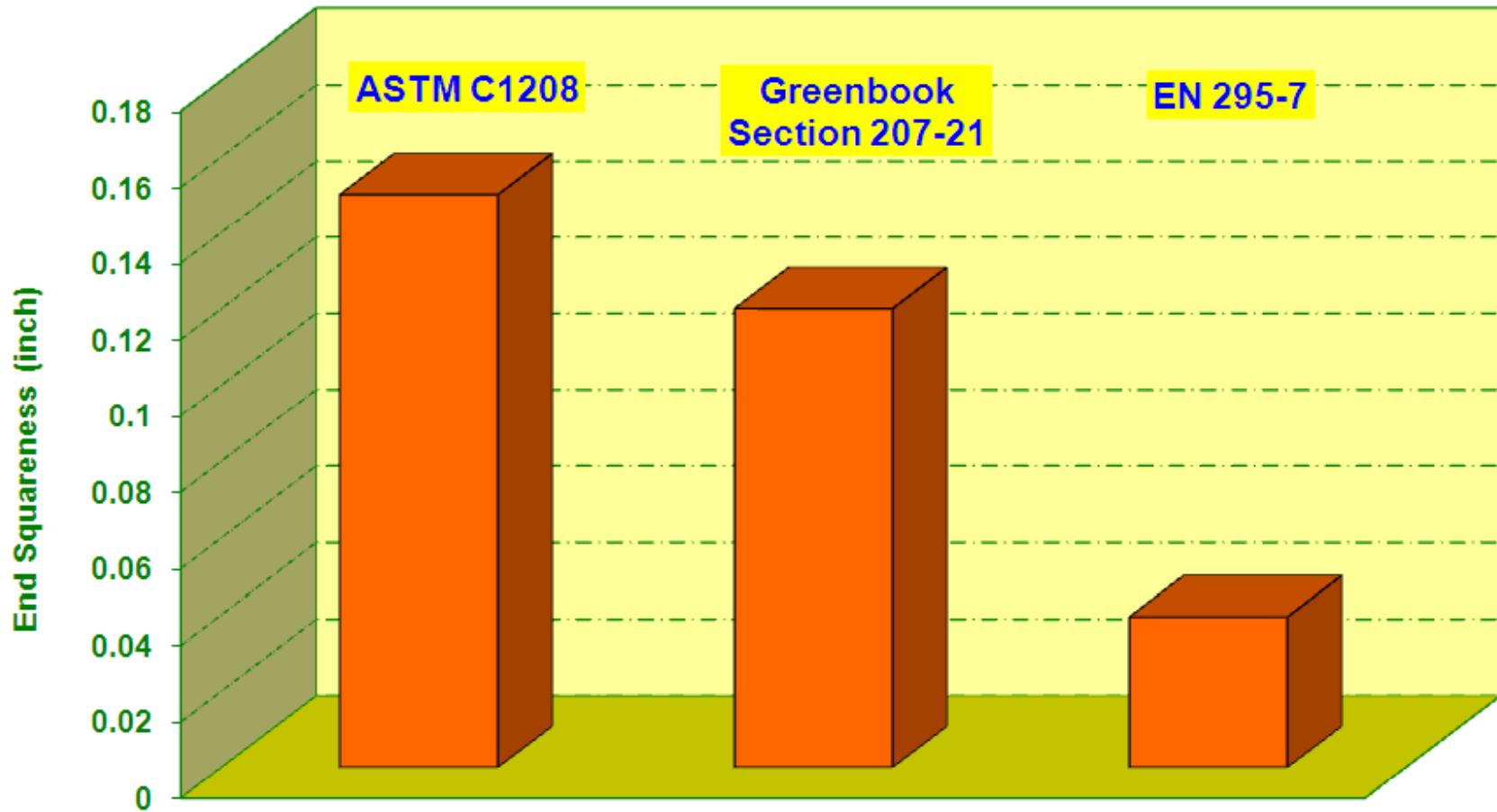
- 1. ASTM C1208 defines roundness as $D_{max} - D_{min} < 0.24$ inch for a 24-inch dia. pipe. For comparison purpose, the roundness was converted to a percentage format.
- 2. Greenbook Section 207-23. Microtunneling Pipe.
- 3. ASTM D6783. Jacking Pipe.
- 4. Greenbook Section 207-22. Microtunneling Pipe.

*Same Type of Pipe has
Different Standards*

Minimum Material Compressive Strength for 24-inch Vitrified Clay Pipe for Tunneling Applications



End Squareness Tolerance for 24-inch Vitrified Clay Pipe for Tunneling Applications



Things to Note when Using Standard Specifications

- More Subtle Differences Exist





Why Should I Care about the Differences?

Significance of Standard and Impact on Pipe Applications

- Pipe Strength
- Material Compressive Strength
- Direct Bury
- Tunnel Application

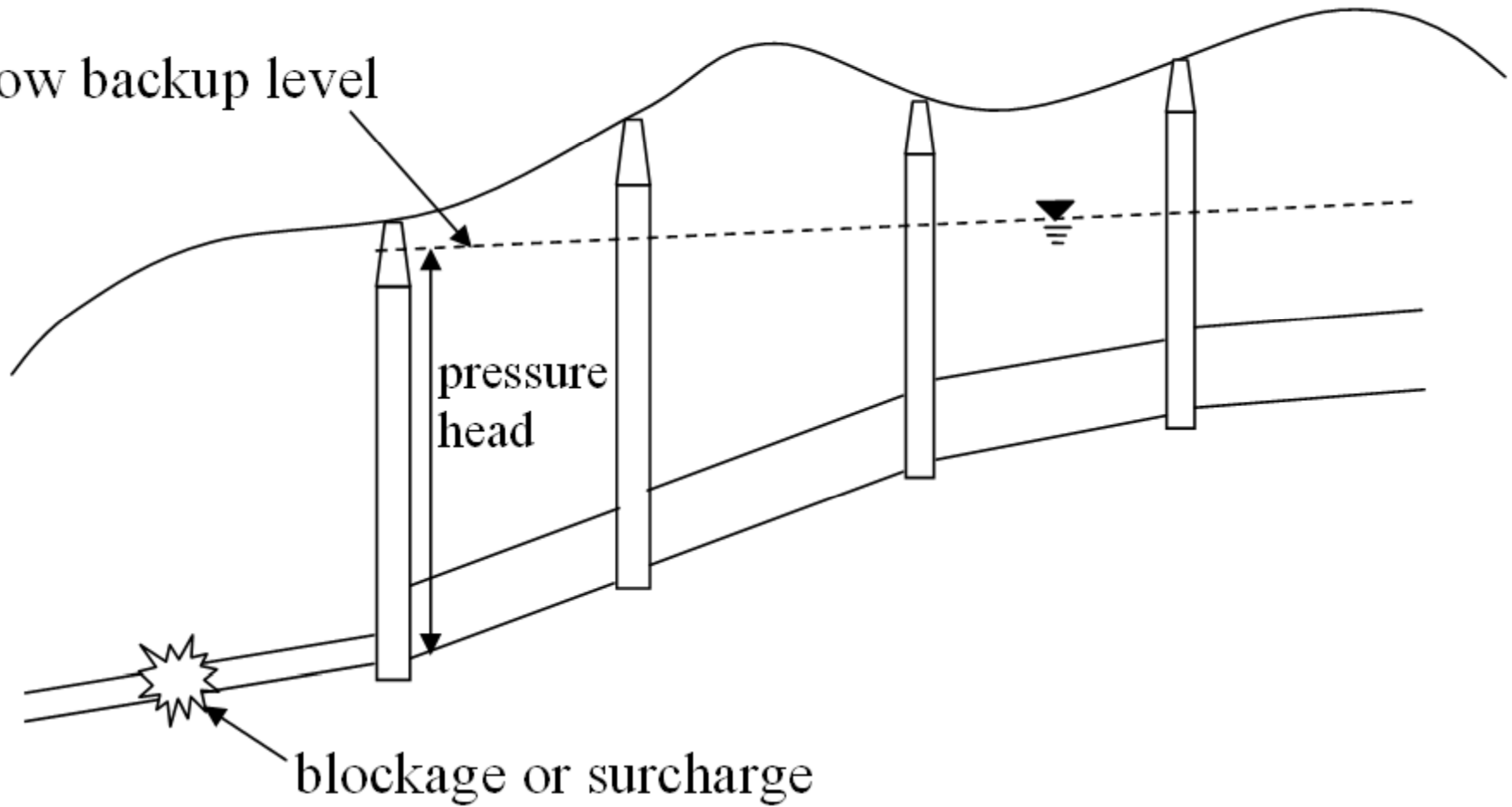
- Gravity Pipe Under Pressure
- Material Property and Pipe's "Pressure Rating"
- Concrete Good for Compression, Not Tension

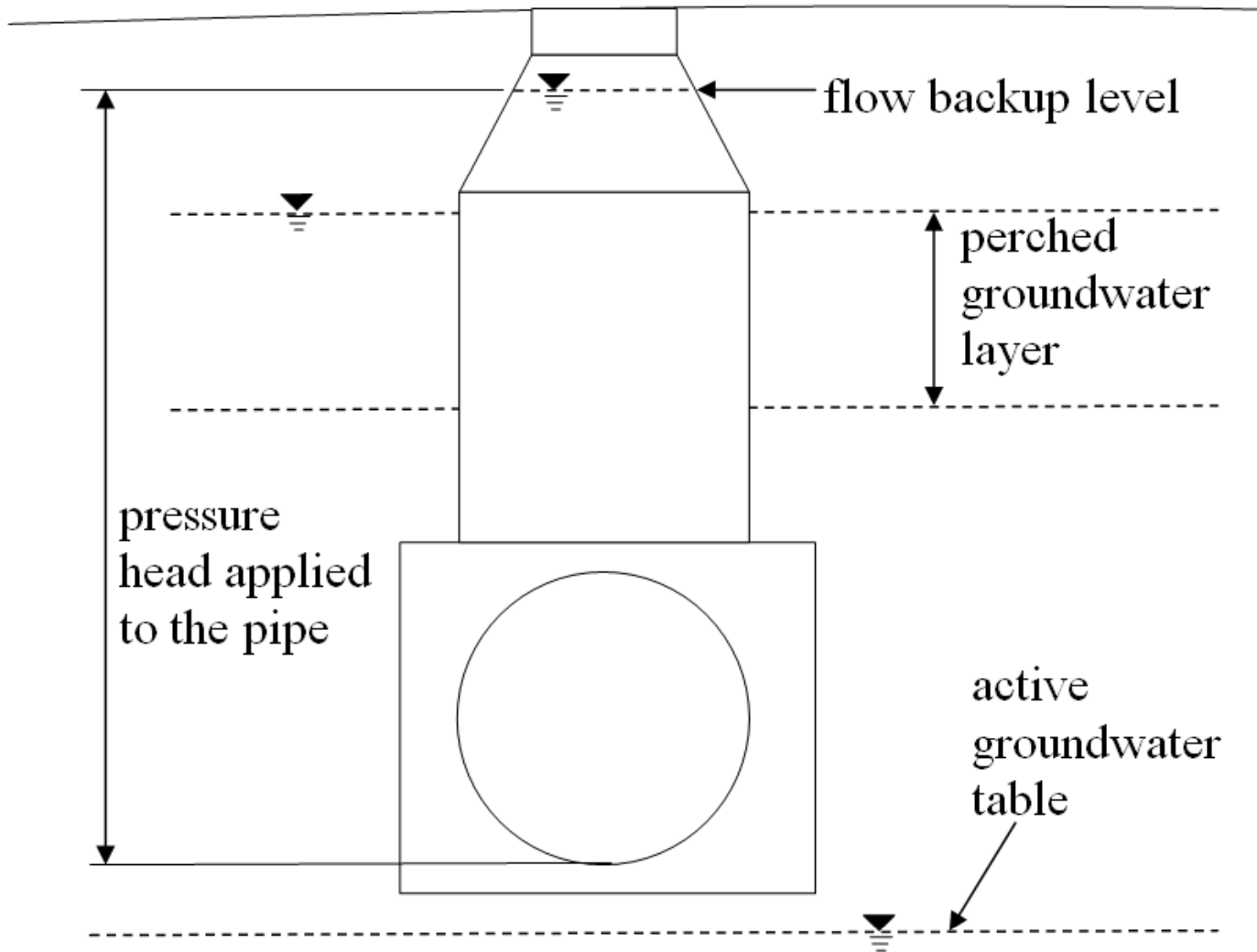


Concrete Compression Test
Source: www.wikipedia.org

- Joint Test Pressure Requirements – Gravity Pipe’s “Pressure Rating”
- Maximum Pipe Installed Depth

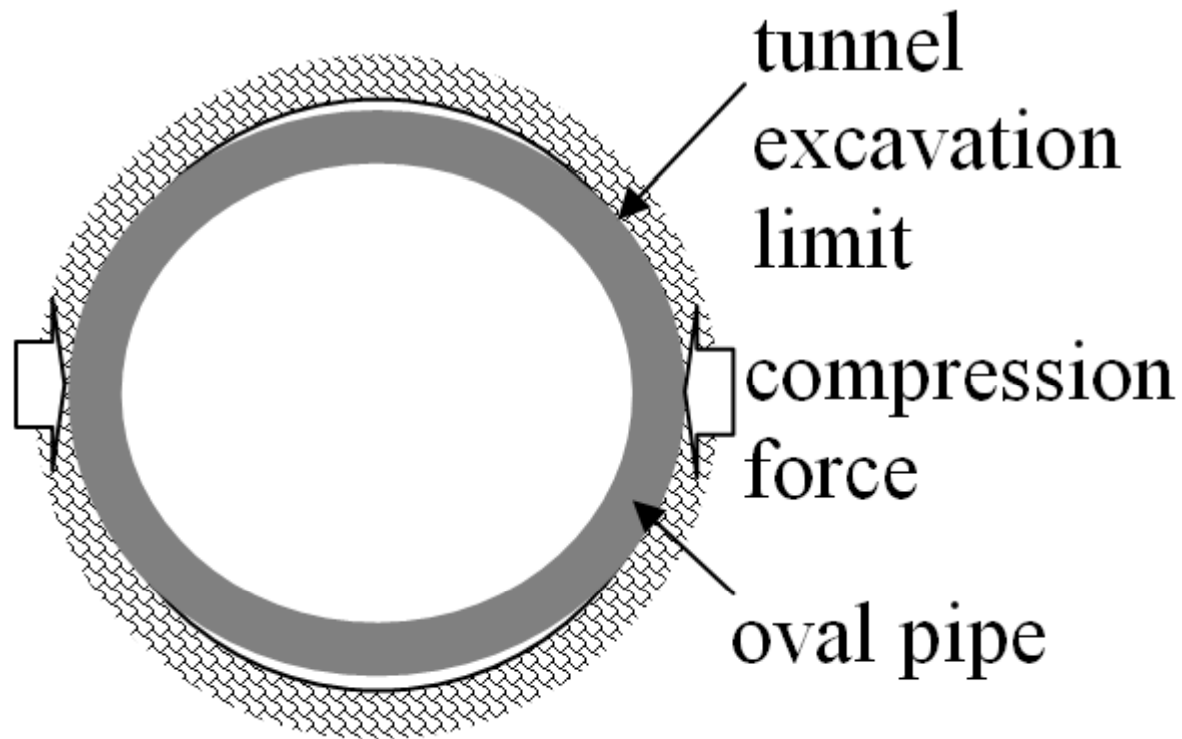
flow backup level

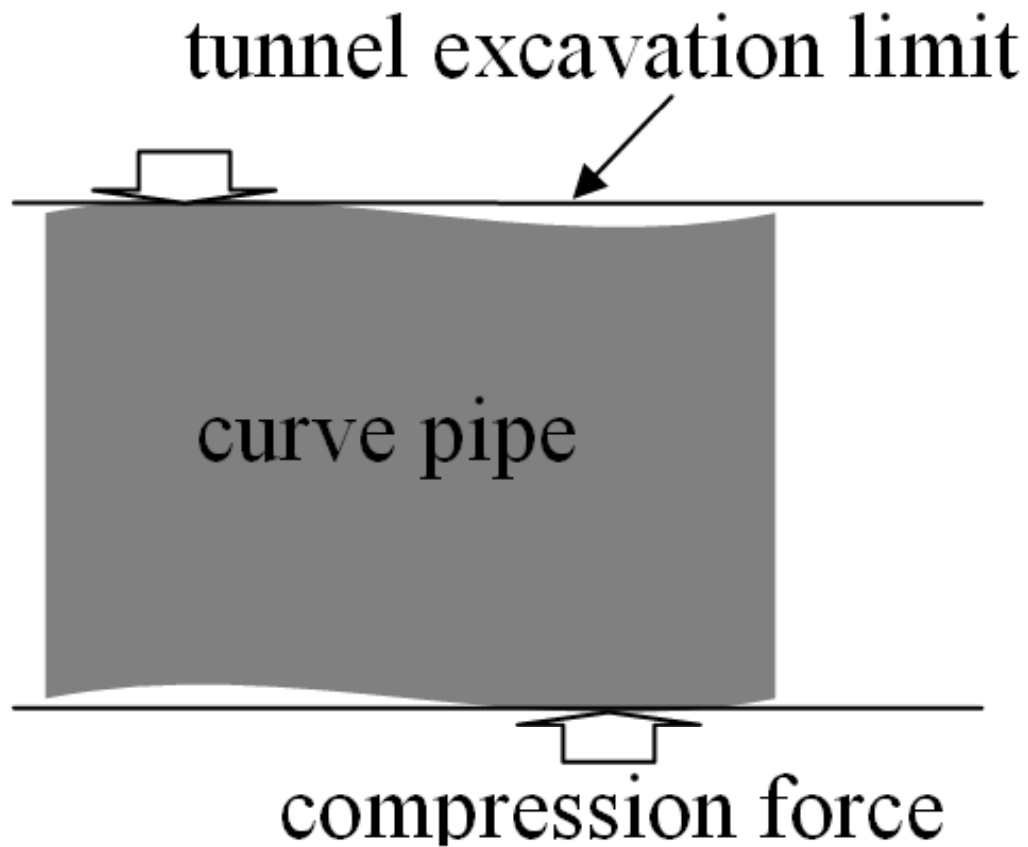


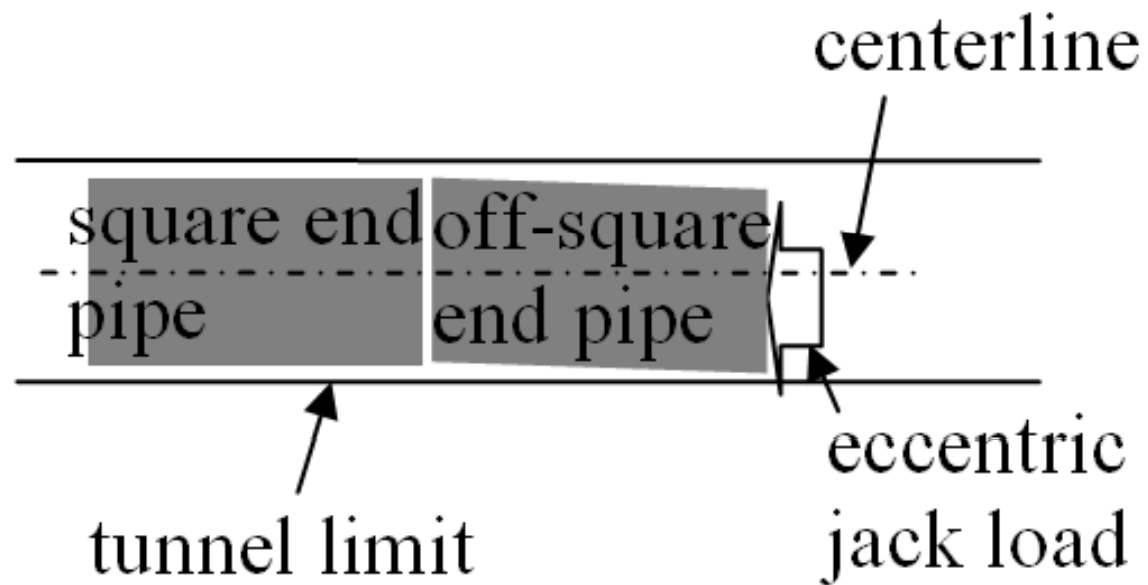


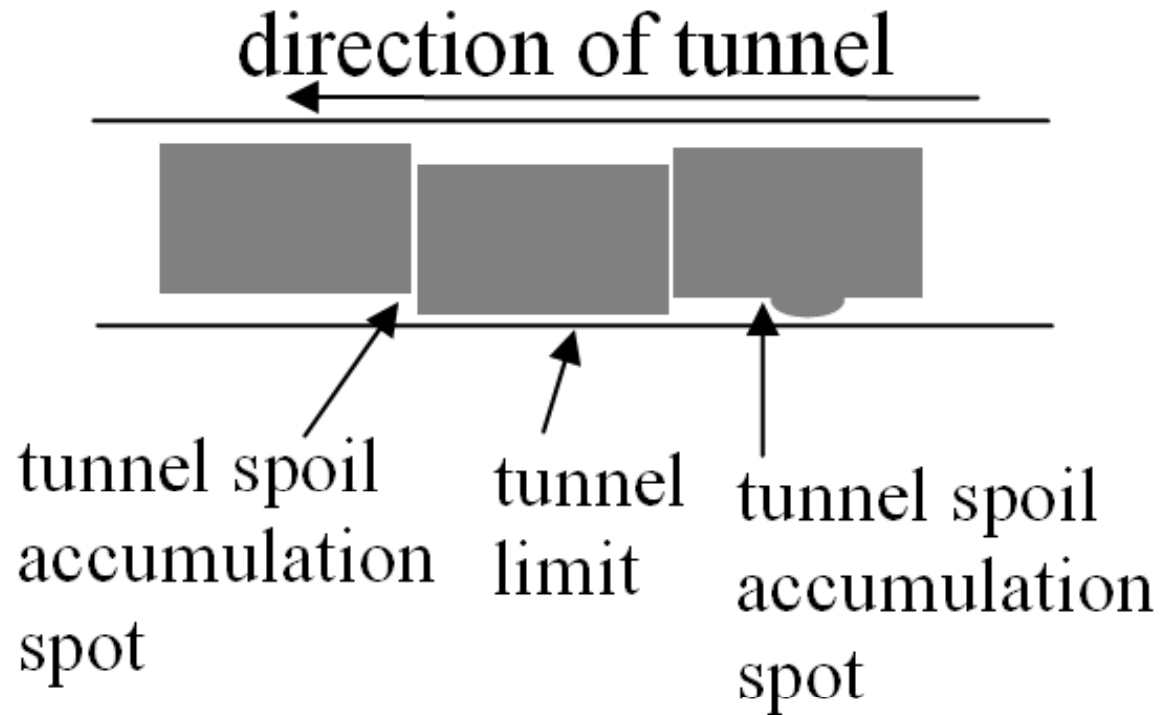
- Material's Chemical Resistance
- A Class V Polymer Concrete Pipe may become Class III after 50 years of Sewer Service

Pipe Dimensional Tolerance

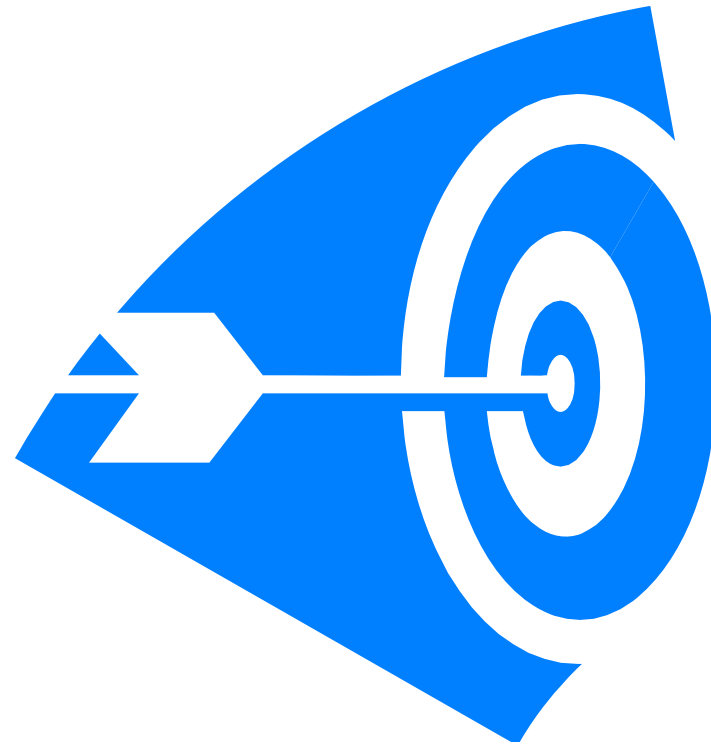








Conclusions



- Variations exist among Standard Specifications
- Requirements may be different even for the same pipe material

- For owner, engineer and contractor, it is prudent to understand the specific requirements and the applicable conditions, especially for pipeline projects with unique features.



Questions and Comments

